

# **STUDY OF FLEXURAL STRENGTH AND DEFORMATION OF COMPLETE UPPER DENTURES AFTER REINFORCEMENT WITH HYBRID AND NEW GENERATION FIBRES**

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## **SUMMARY OF THE RESEARCH PROTOCOL FOR THE DOCTORAL THESIS**

### **Introduction**

The acrylic complete upper denture is a complex mechanical construction because of its special shape. The complexity of the loads applied during the functional loading of the denture due to the varying magnitude and direction of the loads, and the variability in the direction and magnitude of the developing principal stresses, create a multiaxial stress field in the region of the denture's superficial fossa. In addition, the material of choice for the fabrication of complete dentures is acrylic resin, which has a large number of advantages as a material but presents the problem of reduced fatigue resistance, resulting in an average lifetime of a complete denture of approximately five years.

### **Purpose**

The aim of this study is to investigate the effect of new generation fibres and hybrid fibres as reinforcing agents on the fracture resistance of complete dentures. In addition, the effect of fibres on the degree of deformation of complete dentures will also be studied.

### **Materials and Methods**

Five types of new generation and hybrid fibres have been selected for this study. Six groups of samples will be constructed with six identical samples per group. Specifically, one group of specimens will be the control group comprising identical complete dentures without reinforcement, while the other five groups will comprise six identical dentures each group reinforced with one of the five fibre types. The fracture toughness of the complete dentures shall be measured on a special material strength measuring machine, which has been modified to apply loads in a way that simulates the loads are applied during chewing in the oral cavity. In addition, to

measure the deformation of the reinforced dentures, three additional groups will be constructed with three identical dentures per group. Among these three groups, the first will be the control group with non-reinforced dentures while the other two groups will include reinforced dentures with mesh and roving respectively. Electric strain gauges will be cemented on to these three groups and their deformation will be measured using a 6 channel Wheatstone digital bridge. The statistical evaluation of the results (comparison between the mean values of the studied groups) will be done initially by non-parametric ANOVA (Kruskal -Wallis) and the comparison of the mean values between every possible pair of means will be done by non-parametric Mann-Whitney method. In addition, the reliability of the results will be studied using the Weibull analysis method.

### **Expected results**

The null hypothesis for the study is that reinforcement of complete dentures with new generation fibres and hybrid fibres does not alter their fracture strength and also does not alter their deformability. The study will show whether the null hypothesis is rejected or not rejected.